ASBESTOS SOLIDITY STABILIZER
FOR PREVENTING DISPERSION OF ASBESTOS

GMC-200

GUN MYUNG TECHWIN CO. LTD.

Patent registration / New technology certification / Eco label certification
Affiliated R&D institute / ISO quality management / ISO environmental management
Technology—innovative small and medium business (INNOBIZ certification) / Promising small and medium business
<table>
<thead>
<tr>
<th><strong>Company name</strong></th>
<th>Gun Myung Techwin Co, Ltd</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CEO</strong></td>
<td>Cha, Seong-hak</td>
</tr>
<tr>
<td><strong>Date of establishment</strong></td>
<td>July 9, 2008</td>
</tr>
<tr>
<td><strong>Addresses</strong></td>
<td><strong>Head office</strong>: Rm. 1301, Building A, Heungdeok IT Valley, 13 Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do</td>
</tr>
<tr>
<td></td>
<td><strong>Manufacturing plant</strong>: Rm. 1301, Building A, Heungdeok IT Valley, 13 Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do</td>
</tr>
<tr>
<td><strong>Website</strong></td>
<td><a href="http://www.gmtwin.com">www.gmtwin.com</a></td>
</tr>
<tr>
<td><strong>Major business areas</strong></td>
<td>Asbestos solidity stabilizer, CCTV surveillance &amp; construction services for environment and safety</td>
</tr>
<tr>
<td><strong>Major certifications</strong></td>
<td>Performance certification, patent, affiliated R&amp;D institute, certification of excellent venture company and a promising small and medium business in Gyeonggi-do ISO9001, ISO14001, ISO9001, ISO14001, environment certification, INNOBIZ, new technology certification</td>
</tr>
</tbody>
</table>
1. Research & development plan
Previously, “demolishing or removing” was the only option for preventing the problems caused by asbestos, however, we have researched for preventing the dispersion of asbestos as it is prescribed by the Asbestos Safety Control Act.

2. R&D
Previously, “demolishing or removing” was the only option for preventing the problem caused by asbestos, however, we have researched for preventing the dispersion of asbestos as it is prescribed by the Asbestos Safety Control Act.

3. Prototype & patent registration
It is an eco-friendly, inorganic hardening agent with excellent penetrability, and prevents dispersion of asbestos, while enhancing the durability of structures.

4. Factory registration
Manufacturing business of general paints and related products, and 1 other

5. Performance certification
GMC-100, EPC certification (Small and Medium Business Administration)

6. Environmental indicator certification
GMC-100, environmental indicator certification (Korea Environmental Industry and Technology Institute)

7. Market development / pilot project
Pilot project for schools, Cheorwon Office of Education Pilot project for 1 school

8. Pilot project
1 school under the jurisdiction of Ulsan Office of Education On-going pilot project

9. Development of GMC-200 & patent registration
Strengthening the performance of existing products

10. Pilot project
1 school under the jurisdiction of Seoul Office of Education On-going pilot project

11. New technology certification
GMC-200, NET certification (Korea Industrial Technology Association)

12. Environmental indicator certification
GMC-200, environmental indicator certification (Korea Environmental Industry and Technology Institute)

13. Pilot project
Pilot project for 1 school under the jurisdiction of Chungcheongnam-do Office of Education
Pilot project for the student culture center of Jeju Office of Education
Riskiness of asbestos

Asbestos, which is called the silent killer or quiet time bomb, has a latent period of 20~40 years. It is a class 1 cancer-causing agent designated by the World Health Organization (WHO), and there is no limitation for safety regarding the exposure to asbestos.

Diseases related to asbestos

The diseases related to asbestos are Asbestosis, Lung cancer and Mesothelioma, and in most cases, there is no distinct cure for these diseases.
Core material of asbestos solidity stabilizer and its function

Solidifying the asbestos particles
(Nano-silica / layered phyllosilicate)
&
Penetrability
Improving the water surface tension by processing with hydrophobic silane

Silane grafted
Silica & Layer Silicate

<table>
<thead>
<tr>
<th>Name of technology</th>
<th>Patent No. 10–1673851 – Technology applied with a composition, which includes inorganic acid compounds, preventing the dispersion of asbestos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable use</td>
<td>Preventing the generation of dispersed particles of asbestos by applying penetrative coating to construction materials</td>
</tr>
<tr>
<td>Applicable areas</td>
<td>Facilities constructed by using the materials containing asbestos, such as asbestos fiber, slate, cubicle, sheath and insulation material (schools, public organizations, slate, abandoned mine)</td>
</tr>
<tr>
<td>Major ingredients</td>
<td>Silicate nano-colloid / saline / water–based acrylic resin</td>
</tr>
</tbody>
</table>

About GMC–200 Technology
About GMC-200 Product

It is a product stabilizing asbestos particles, which can be created by physical influences, such as damage and external vibration, by flocculating and solidifying them after being penetrated into the surface or the interior of construction materials containing asbestos.

Asbestos solidity stabilizer GMC-200

01 Patent No. 10–1673851
Registered as a patent for the composition, which includes inorganic acid compounds, preventing the dispersion of asbestos

02 Patent No. 10–1840971
Patent registration of the composition with improved penetrative performance preventing the dispersion of asbestos

03 New technology certification No. 1077
It is a product which its dustability, penetrative performance and water resistance are improved by applying the asbestos dispersion prevention technology using silicate nano-colloid, saline and water–based acrylic resin

04 Environmental indicator certification No. 17094
Reducing the pollution of local and living environments and harmful substances
Applicable areas of GMC–200

If air quality measurement exceeds 0.01 piece/cc based on the environmental standard

Spray the product evenly to make them penetrated into the material

Ceiling fiber and fire resistive covering material containing asbestos in building demolition sites

01 Application time

02 Application method

03 Applicable parts

Heat-reserving board & insulation

Sound-absorbing materials

Gypsum cement plate(tax)

Fire resistive covering materials

asbestos abandoned mine

building asbestos waste

asbestos slate

Plastering work of insulation (fireproof spray coat)

Building asbestos Exterior
Differences between asbestos removal and using solidity stabilizer

<table>
<thead>
<tr>
<th>Classification</th>
<th>Removal</th>
<th>Prevention of asbestos dispersion</th>
<th>GMC–200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>• Authorized business removes asbestos, and re-constructs</td>
<td>• Product for coating inorganic synthetic resin</td>
<td>• Eco-friendly water-based asbestos solidity stabilizer</td>
</tr>
<tr>
<td></td>
<td>• Necessary to cooperate with waste disposal contractors</td>
<td>• Using the painting skills (application on front only)</td>
<td>• Using the painting skills (application on both sides)</td>
</tr>
<tr>
<td></td>
<td>• Additional constructions may be necessary after removal</td>
<td>• Most of the businesses are using imported products</td>
<td>• Patent for composition (No. 10–1673851)</td>
</tr>
<tr>
<td></td>
<td>• Authorized business removes asbestos, and re-constructs</td>
<td>• Product for coating inorganic synthetic resin</td>
<td>• Using the painting skills (application on both sides)</td>
</tr>
<tr>
<td></td>
<td>• Necessary to cooperate with waste disposal contractors</td>
<td>• Using the painting skills (application on front only)</td>
<td>• Patent for improved penetration performance (No. 10–1840971)</td>
</tr>
<tr>
<td></td>
<td>• Additional constructions may be necessary after removal</td>
<td>• Most of the businesses are using imported products</td>
<td>• New technology certification (No. 1077)</td>
</tr>
<tr>
<td></td>
<td>• Eco-friendly water-based asbestos solidity stabilizer</td>
<td>• Using the painting skills (application on both sides)</td>
<td>• Environmental certification (No. 17094)</td>
</tr>
<tr>
<td>Period</td>
<td>Minimum 1 month</td>
<td>3~5 days</td>
<td>3~5 days</td>
</tr>
<tr>
<td>Advantages</td>
<td>• Possible to remove asbestos completely</td>
<td>• No creation of designated wastes and secondary environmental pollution</td>
<td>• Approved dispersion preventing performance / penetrative performance / water resistance (Korea Industrial Technology Association)</td>
</tr>
<tr>
<td></td>
<td>• High cost (for demolition and using materials to replace asbestos)</td>
<td>• Limited application to actual environments due to lack of water resistance</td>
<td>• No creation of designated wastes and secondary environmental pollution</td>
</tr>
<tr>
<td></td>
<td>• Construction or expansion is limited</td>
<td>• Lack of verification of dispersion prevention performance</td>
<td>• Not possible to be processed as general wastes for further demolition</td>
</tr>
<tr>
<td></td>
<td>• Causing secondary environmental pollution</td>
<td>• Not possible to be processed as general wastes for further demolition</td>
<td>• Not possible to be processed as general wastes for further demolition</td>
</tr>
<tr>
<td></td>
<td>• Creating costs for waste disposal and taking much time</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How to use asbestos solidity stabilizer

<table>
<thead>
<tr>
<th>Classification</th>
<th>Method of using the product according to the market of asbestos solidity stabilizer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance of buildings and abandoned mines with asbestos</td>
<td>• Asbestos materials of the domestic schools, public offices and general buildings cannot be removed at the same time, and people have to be under the influence of asbestos while waiting for its removal.</td>
</tr>
<tr>
<td></td>
<td>• In the case of abandoned mines, it is not possible to remove the remaining asbestos, and the nearby residents may be influenced consistently.</td>
</tr>
<tr>
<td></td>
<td>• It is possible to secure safety from the influence of asbestos without removing it by spraying the asbestos solidity stabilizer.</td>
</tr>
<tr>
<td>Apply when demolishing asbestos-containing structures</td>
<td>• Presently, the removal of asbestos from schools or public offices still creates residual asbestos dusts, and the indoor air quality is still below the standard.</td>
</tr>
<tr>
<td></td>
<td>• Environmental organizations insist that the removal work is diffusing the pollution created by asbestos.</td>
</tr>
<tr>
<td></td>
<td>• By using the asbestos solidity stabilizer when removing asbestos, it is possible to solve the problems of the worker’s safety, and to prevent the dispersion of asbestos after removal.</td>
</tr>
</tbody>
</table>

Applicable areas for using the asbestos solidity stabilizer: Maintenance of buildings containing asbestos materials / demolition work of buildings containing asbestos materials
Reliability of the product

Performance of preventing the dispersion of asbestos particles

<table>
<thead>
<tr>
<th>Evaluation items</th>
<th>Unit</th>
<th>Standard</th>
<th>Result</th>
<th>Evaluation method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Test for fiber dispersion caused by air flow</td>
<td>Piece/cc</td>
<td>0.01 piece/cc</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>2. Test for fiber dispersion caused by surface damage</td>
<td>Piece/cc</td>
<td>0.01 piece/cc</td>
<td>0.003</td>
<td>KS M 2757 : 2014</td>
</tr>
<tr>
<td>3. Test for fiber dispersion when it is shredded</td>
<td>Piece/cc</td>
<td>0.01 piece/cc</td>
<td>0.003</td>
<td></td>
</tr>
</tbody>
</table>

Analysis using a scanning electron microscope (SEM)

- Asbestos fiber
  - Surface(x500)
  - Fracture surface(x1000)
  - Fracture surface(x3000)

- After applying GMC-200
  - Surface(x500)
  - Fracture surface(x1000)
  - Fracture surface(x3000)
Comparison of each product’ s performance of preventing the dispersion of asbestos

<table>
<thead>
<tr>
<th>Evaluation items</th>
<th>Unit</th>
<th>Standard</th>
<th>Evaluation result</th>
<th>Evaluation method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fiber dispersion test (Aerosol)</td>
<td>Piece/cc</td>
<td>0.01 or less</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GMC-200 (New product)</td>
<td>0.023</td>
<td>0.002</td>
<td>KS M 2757:2014</td>
<td></td>
</tr>
<tr>
<td>Ref-A (Exx)</td>
<td>0.017</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ref-B (xxx-100)</td>
<td>0.007</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ref-C (XX-1000)</td>
<td>0.011</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Fiber dispersion test (Shredding)</td>
<td></td>
<td>0.037</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>GMC-200 (New product)</td>
<td>0.027</td>
<td>KS M 2757:2014 (KTR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ref-A (Exx)</td>
<td>0.019</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ref-B (xxx-100)</td>
<td>0.014</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Certified test results (Korea Testing & Research Institute/KTR) 2017.2.9

Basic property of each product & coating characteristics of asbestos board

<table>
<thead>
<tr>
<th>Evaluation items</th>
<th>GMC-200 (Gun Myung developed product)</th>
<th>Evaluation result</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Translucent suspension</td>
<td>Translucent suspension</td>
<td>Visual observation</td>
</tr>
<tr>
<td>pH</td>
<td>10±0.2</td>
<td>11 ± 0.2</td>
<td>pH meter @25°C</td>
</tr>
<tr>
<td>Viscosity (Viscosity, mPa·s)</td>
<td>1.5±0.2</td>
<td>2.0±0.2</td>
<td>AND SV-10 @25°C</td>
</tr>
<tr>
<td>Solid content (%)</td>
<td>9.4±0.2</td>
<td>20±0.1</td>
<td>@120°C/2hr</td>
</tr>
<tr>
<td>Coating characteristics</td>
<td>Good</td>
<td>Powder separation</td>
<td>@120°C/2hr</td>
</tr>
</tbody>
</table>
Result of penetration analysis through EDS (elementary analysis)

- **Result analysis**: Comparison of internal distribution according to depth realized by comparing the graph of K–edge spectrum’s intensity of K element

- **Evaluation sample**: GMC–200 & 3 prototypes (Ref.–A,B,C)

- **Making a specimen**: Coat the back side of asbestos fiber, of which the size is that of a slide glass, with 4 solutions for evaluation. Dry it at 100°C for 1 hour after making them penetrate for 60 minutes. Cut the specimen vertically, and analyze the element distribution of the fracture surface through EDS.
  ※ Analyze the elements using the potassium (K) as an indicator (In the case of Ref.B, coat by randomly mixing with K2SiO3)

- **Analysis equipment**: HITACHI–S4800 FE–SEM (Common equipment center of Hanyang University)
Result of comparing with the water resistance of other company’s products

Result of comparing water resistances

- In the case of GMC-200, no particular change of the coated layer is observed.
- In the case of Ref. A and Ref. C, deposited area becomes opaque. The surface is changed into granular materials and easily separated.
- In the case of Ref. B, the coated layer is partially melted and separated.

Method of comparing water resistances

- Coat the slide glass with each coating solution and harden it (120℃/30min.)
- Fill the beaker with distilled water, and dip half of the coated part into it.
- Dip for 30 min, at the room temperature (25℃)
- Observe the exterior of specimen after drying it for 10 min, at 120℃

Analysis of heavy metal content of the solidity stabilizer

<table>
<thead>
<tr>
<th>Items</th>
<th>Unit</th>
<th>Analysis result</th>
<th>MDL</th>
<th>Test Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pb</td>
<td>mg/kg</td>
<td>Not detected</td>
<td>5</td>
<td>IEC 62321–5 Ed.1.0:2013(AAS)</td>
</tr>
<tr>
<td>Cd</td>
<td>mg/kg</td>
<td>Not detected</td>
<td>0.5</td>
<td>IEC 62321–5 Ed.1.0:2013(AAS)</td>
</tr>
<tr>
<td>Hg</td>
<td>mg/kg</td>
<td>Not detected</td>
<td>0.5</td>
<td>IEC 62321–4 Ed.1.0:2013(AAS)</td>
</tr>
<tr>
<td>Cr(VI)</td>
<td>mg/kg</td>
<td>Not detected</td>
<td>0.5</td>
<td>IEC 62321 Ed.1.0:2008(UV/Vis)</td>
</tr>
</tbody>
</table>

*Notes : mg/kg = ppm (parts per million), N.D.=Not detected, MDL = method detection limit

*Analysis sample: GMC-200, analysis agency: Korea Testing & Research Institute (KTR)/ December 5, 2016
Expected effects

01 Technical side
- Establishing application technology of coating stabilizer for preventing the dispersion of asbestos
- Securing water resistance improvement technology for water-soluble paint
- Securing technology of protective agent's penetration performance for preventing the water absorption of concrete buildings
- Possible to replace existing paint ingredients
- Establishing independent technology based on the standardization of construction process

02 Economic & industrial side
- Increase the use of dispersion preventing agent by expanding the application to asbestos containing materials
- Reducing the national budget by replacing the existing method of removing asbestos
- Economic vitalization by hiring new personals while saving the development cost
- Preventing the secondary pollution by improving the residential environment without creating wastes

03 Social side
- Creating jobs through developing independent technology
- It is possible to convert the dispersion-preventing agent, which is presently used for the removal of asbestos and producing plate-type materials, into a high value-added business
- Solving the problems of air pollution

Surface-hardening agent for preventing dispersion
GMC-200

- Maintaining the pleasant indoor air
- Preventing the asbestos-related diseases
- Excellent penetration performance
- Improving the durability (water resistance) of construction materials
- Simple application
- Expanding the application area
- Zero heavy metals
- Zero wastes
- Zero VACs detection
- Lower than TVOC standard
- Lower than VOCs standard
- Reducing cost by 60% comparing to the existing removal method
- Excellent ratio of preventing the dispersion of asbestos

Maintaining the pleasant and safe indoor air
Improving the durability of construction materials
Reducing the construction period
Eco-friendly product, securing students’ right for health
Reducing the national budget
Applicability of technology

1. Pre-investigation
   • Check the application area
   • Measure the area, and estimate the amount of materials

2. Measurement of indoor air quality
   • Check the indoor air quality before application

3. Security zone setup
   • Install a control facility at the construction site

4. Preconditioning
   • Remove foreign objects and dusts
   • Arrange and repair the application area

5. Electricity / wiring
   • Arrange the wires to apply the product on the surface

6. Reinforcement work
   • Reinforce materials attached to the ceiling
   • Reinforce floor and walls

7. Application on upper areas
   • Check the application area
   • Measure the area, and estimate the amount of materials

8. Application on lower areas
   • Apply by spraying it twice
   • Apply thoroughly and evenly

9. Reinforcement and arrangement
   • Remove the residual materials and check the surface

10. Finishing application of each part
    • Apply to finish the stained area

11. Measuring the indoor air quality
    • Measure the indoor air quality in the same classroom after application

12. Cleaning after completion
    • Clean the area thoroughly after completing the application

Apply asbestos solidity stabilizer
Certification and registration status

Letter of patent
No. 10–1673851

Letter of patent
No. 10–1840971

New technology certification
No. 1077

Environmental indicator
certification
No. 17094

Letter of patent
No. 10–1541006

Certificate of quality
management system
ISO 9001

Certificate of environmental
management system
ISO 14001

Certificate of R&D institute
affiliated to enterprise

Certificate of Inno-Biz

Promising small and medium
business of Gyeonggi-do
The company prioritizing the people
The company prioritizing the environment

GUN MYUNG TECHWIN CO. LTD.